

# INVITATION

## **Advanced Concrete Engineering** **Graduate course, 7,5 ECTS credits, given in spring 2020 by Chalmers**

### **Content and objectives**

Advanced Concrete Engineering deals with structural materials, components, connections, structural systems and special applications of reinforced and prestressed concrete. Issues related to different phases are treated such as conceptual design, design and detailing, production, operation and assessment. The course content is complementary to education about concrete structures at undergraduate and master's levels.

The content of the course can be described with the following main areas:

- material behavior, mechanics and modelling of various types of concrete, reinforcement and prestressing units,
- behavior, modelling, design and detailing of components and connections in concrete structures,
- design issues, problems and solutions in modern types of structural systems,
- development of solutions with regard to efficient use of resources and sustainability during production and operation

The aims of the course are to promote development of a deeper understanding of reinforced and prestressed concrete, and to widen the knowledge of various modern applications and current design issues.

### **Learning outcomes**

After the course the participant should be able to

- describe the field of concrete engineering, its challenges and possibilities,
- solve various problems in concrete engineering, development and research,
- communicate fundamental knowledge in the field of concrete engineering in a pedagogical way
- relate their own research topic or development work to the field of concrete engineering.

### **Attendance**

Recommended basis for the course is master's level in Structural engineering. The course should be of interest for

- graduate students, teachers and researchers in structural concrete and concrete science,
- practicing structural engineers intending to specialize in concrete engineering.

## Course plan

The course will take place in spring 2020 and will have a total duration of about four months and includes three preparation periods (four weeks each) and three concentrated sessions (three days each).

**Preparation period 1:** week 6 – 9

**Session 1:** week 10 (Tuesday-Thursday March 3 – 5)

**Preparation period 2:** week 11 – 14

**Session 2:** week 17 (Tuesday-Thursday April 21 – 23)

**Preparation period 3:** week 18 – 21

**Session 3:** week 22 (Tuesday-Thursday May 26 – 28)

**Note!** The value of the course depends very much on the effort of the participants during the preparation periods and the active contributions to discussions and group work at the sessions. Therefore, high engagement and involvement are requested.

The literature and lectures are in English.

## Registration

Registration for the course should be made no later than **December 15, 2019** by e-mail to Kamyab Zandi, [Kamyab.zandi@chalmers.se](mailto:Kamyab.zandi@chalmers.se). Please state your name, phone, e-mail address, affiliation and your research topic.

The basic registration fee is 20 000 SEK. Participation is free for PhD students from

- research groups within the Structural Engineering field of [Sveriges Bygguniversitet](#) (i.e. Chalmers, KTH, Luleå and Lund)
- [Nordic Five Tech](#) universities (i.e. DTU, NTNU, Aalto University, KTH and Chalmers)

For other PhD students, information about payment can be obtained from contact person. The cost for travel and accommodation has to be covered by each participant.

## Course organization

The course is a part of the course program in the National graduate school in Structural Engineering within 'Sveriges Bygguniversitet'. The course venue is Chalmers.

Responsible teaching staff and lecturers: Kamyab Zandi, Mario Plos, Karin Lundgren, Joosef Leppänen, Ingemar Löfgren, Morgan Johansson, Carlos Gil Berrocal and Teresa E Chen at Chalmers.

Contact: Kamyab Zandi, [kamyab.zandi@chalmers.se](mailto:kamyab.zandi@chalmers.se)

## Detailed procedure for preparations and contributions

### Selection of topics

The main subject 'Advanced Concrete Engineering' will be divided into a number of proposed topics and will be announced after the registration deadline. The selection of topics covered in the course is partly influenced by the interest and preferences of the participants. Lectures covering the selected topics will be prepared during the preparation periods by participants. For each topic there will be one supervising teacher who instructs and supervises the participant during the preparation period. The supervising teacher attends the lecture and leads the final discussion.

### Design of a lecture

<b>45 min</b>	<b>Oral presentation</b> based on a slide show with notes
<b>30 min</b>	<b>Active learning exercise</b> All participants should be activated to reflect and learn
<b>15 min</b>	<b>Summing up and final discussion</b> The supervising teacher concludes

Each topic is treated during a 2-hour lecture. The lectures should be prepared such that all participants can reach the learning outcomes specified by the supervising teacher.

One of the course participants introduces the topic by a prepared oral presentation (45 minutes) according to an instruction that is distributed in advance. This is followed by an active learning exercise (30 minutes including presentation of the task), also prepared by the same course participant. The teacher responsible of the topic sums up the discussion and gives, if needed, complementary information (15 minutes).

### Preparations

Each course participant will get a few topics to prepare (two or three topics) during the preparation period, considering the learning outcomes specified by the supervising teacher for each topic. Note that the learning outcomes should be reached by all participants during the lecture, not only by the participant who prepares the lecture.

The subject should be studied using the literature advised by (and perhaps provided by) the supervising teacher. Complementary information may be searched and used. Written documentation should be prepared and sent to the supervising teacher at least two weeks in advance (before the day of the presentation). There should be time for review, to get feedback and to make corrections and complementary work.

The following should be prepared for each topic:

- **Oral presentation**, about 45 minutes, supported by slides with text in English.
- **Written documentation** in English. Preferably the slides with notes in a notes field. The target group consists of students at master's level (advanced courses or master's projects).
- **Active learning exercise** that force the participants to reflect over the topic and get a deeper understanding. This could be group work in small groups, exercise or problem solving or a quiz followed up by discussion. The activity should also check whether the participants learned something during the lecture. In total 30 minutes including time for discussion (about 15 minutes for activity in groups or individual and 15 minutes for presenting results and discussion).

#### Documentation

The written documentation is put together into a course compendium in English. Students in master's courses should later be able to use this compendium in courses or in connection with master's projects.

#### Time plan

December 15, 2019: Final date for registration.

February 3, 2020: Topics are distributed among the course participants, and the first preparation period starts.

Two weeks before the actual session: The prepared presentation and proposed active learning exercise are sent to the supervising teacher, who gives feedback and advises within one week.

One week before the actual session: Further development of the presentation.